(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 411 598 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90114739.7**

(51) Int. Cl.5: **B27N 1/02**, B27N 5/00

(22) Date of filing: **01.08.90**

(30) Priority: **02.08.89 IT 2141489**

(43) Date of publication of application:
06.02.91 Bulletin 91/06

(84) Designated Contracting States:
AT BE CH DE DK ES GB GR LI LU NL SE

(71) Applicant: **Losio, Gianfranco**
Strada Regina, 83
I-27029 Vigevano PV(IT)

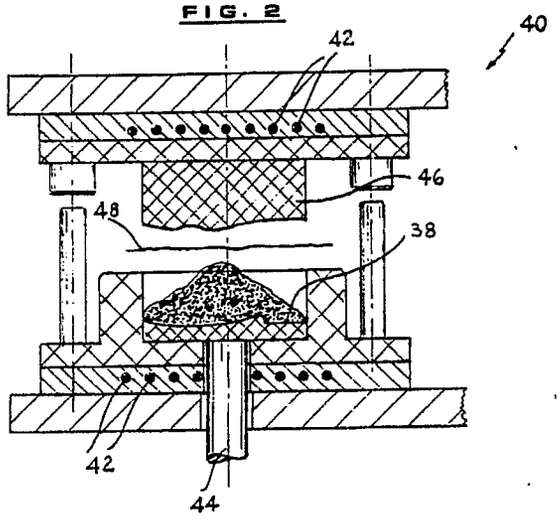
(72) Inventor: **Losio, Gianfranco**
Strada Regina, 83
I-27029 Vigevano PV(IT)

(74) Representative: **Lecce, Giovanni**
UFFICIO BREVETTI CALCIATI S.r.l. via G. Negri,10
I-20123 Milano(IT)

(54) Process for obtaining polyurethane compounds containing granules of cork or similar substances, particularly for the manufacture of soles for footwear, apparatus for realising this process, and the product so obtained.

(57) This procedure refers to the incorporation of granules of cork or similar substances into polyurethane products. The polyurethane components and the cork (or similar) granules are introduced simultaneously into a suitable mixing chamber, the granules being suitably dosed by variable speed programmable screw conveyors (or otherwise, for example pneumatic feeds, mechanical pistons, etc.). The conglomerate as above is introduced, while still in the early stages of reaction, into fixed or moveable moulds or dies by gravity (with the mould open), or by injection (with the mould closed), and completes its reaction there, forming the product in times which vary according to the characteristics of the mixture used and the shape of the article produced. The moulds or dies are preferably kept at a temperature of about 50 ° C, though this is not critical since this factor also varies widely according to the polyurethanes used and the pieces being produced.

FIG. 2



EP 0 411 598 A2

PROCESS FOR OBTAINING POLYURETHANE COMPOUNDS CONTAINING GRANULES OF CORK OR SIMILARI SUBTANCES, PARTICULARLY FOR THE MANUFACTURE OF SOLES FOR FOOTWEAR, APPARATUS FOR REALISING THIS PROCESS, AND THE PRODUCT SO OBTAINED.

The object of this present discovery is a procedure for the preparation of polyurethane compounds embodying granules of cork or similar materials, particularly for the manufacture of soles for footwear. Cork granules are widely used in production processes which result in composite materials used, for example, as acoustic insulators; and in such cases the cork is mixed with cement, while in others it may be mixed with bitumen or resins, leading to the production of panels or sheets for covering walls. The same granules are also widely used for making stoppers for bottles, according to a process which involves compression and the addition of binders With reference to the footwear industry, cork granules are used for making soles for light shoes, by processes which lead to the production of a conglomerate of cork and rubber, or rubber latex, or similar materials. These components, suitably mixed together, are put into moulds and then compressed and heated until the rubber vulcanises, thus incorporating and binding together the cork granules. This known process however requires the compound to be raised to a high temperature, which sometimes reaches and exceeeds 150 ° C. Various problems are created by this heating, connected mainly with the fact that the soles, especially in their thinner parts, tend to darken; and also, still because of the high temperature, the layer of leather which traditionally covers the sole on the side which supports the foot and which is inseparably attached to it during the forming process, tends to stretch and then to become shiny and to blacken in an irregular way, thus partly losing its functional characteristics and creating unpleasant aesthetic effects.

The scope of the present discovery is to avoid the above-mentioned inconveniences, and to realise a procedure for obtaining polyurethane compounds incorporating cork or similar granules in variable but predeterminable concentrations, so that the said composite materials will be suitable for use particularly in the manufacture of soles for footwear. The discovery is fundamentally characterised by the fact that it uses, in association with the aforesaid granules, polyurethane compounds which do not require high reaction temperatures, in place of the traditional products like rubber, microfoamed rubber, and latex.

The known problems of agglomeration connected with the use of polyurethane, and connected with the reaction times of the resins and the isocyanates, have been solved by use of the apparatus hereinafter described.

The advantages deriving from use of the discovery refer firstly to the fact that the reaction times are appreciably reduced as compared with those needed for the vulcanisation of rubber; as also is the temperature which, according to the process which is the basis of the discovery, is comprised between 25 ° C and 50 ° C. The saving of energy and the saving correlated with the very short operation times are therefore obvious. Furthermore the product which is obtained has an aesthetic value due to the regular distribution of the grains of cork, which can have a very high concentration, and do not show any alterations due to scorching or blackening due to the temperature. The product is also more flexible, lighter, and tougher compared with the products obtained by the traditional methods described earlier on.

These, as well as other specific characteristics of the present discovery, will be better identified in the course of the description which follows, which makes reference to the attached drawings in which:

Fig. 1. shows a schematic side view, partly in section, of the mixing vessel to which the various components are added;

Fig. 2. shows a longitudinal section of one of the various shaping moulds with a mobile forming die;

Fig. 3. shows the same mould, in side view and partly in section, during the phase of actually forming a product.

Reference to the above figures will enable the various phases of the productive process to be clearly distinguished as well as the structure of the device which is used for it. The process consists fundamentally of the following steps:

A. Introduction into the upper part of the mixing vessel of the basic constituents of polyurethane, namely resins and isocyanates;

B. Contemporaneous introduction into the mixing chamber, during Phase A, of cork granules by means of a screw conveyor whose speed can be programmed. The granules are mixed into the polyurethane compound during the reaction phase by means of the multibladed agitator;

C. Transfer of the composite mixture into the forming mould;

D. Closure of the mould, which is already at the desired temperature;

E. Opening of the mould and extraction of the manuafctured articles.

The equipment conceived and made for carrying out the process is composed, as can be seen

from the attached drawings, of a mixing unit, the whole being indicated as 10, itself composed of a cylindrical vessel 12 within which runs an agitator with many blades 14 on a rotating shaft 16.

Above it are situated feed pipes 18-18′, with valves 20-20′ whose opening and closing is programmed for the admission of the basic components of the polyurethane, namely resins (polymerised oils) and isocyanates, coming from two tanks 22-22′ and continually recirculated through the return pipes 24-24′. The mixing vessel 12 is prolonged towards the bottom so as to create, below the agitator, a chamber 26 intended to collect in the first place the polyurethane compound in process of polymerising due to the centrifuging to which it has been submitted, and secondly the granules of cork or similar delivered to the same part 26 of the vessel 12 by the screw or spiral conveyor 28, which is driven by motor 30. The hopper 32 is suitable for holding these same granules, which are drawn in through the opening 34 and pushed into 26 by the above mentioned screw conveyor 28.

The conveyor, depending on the speed of the motor 30, its own dimensions and shape at the throat, transfers a pre-established quantity of granules which thus get mixed into the newly formed or still reacting polyurethane compound which is in any case not yet solidified. The compound embodying the mixed-in cork granules then passes through orifice 36 in the bottom end of the vessel 12, by gravity or under pressure (produced by screws or injectors) into the cavities 38 of the various shaping moulds, conveniently installed on a multistation rotating transfer machine.

The shaping moulds, indicated by 40 as a whole, are designed so that the capacity of the cavity 38 can be increased so as to accept a considerable quantity of the composite material. As can be seen in Fig.2., at the moment that the composite polyurethane/cork compound is introduced, through orifice 36 in vessel 12, the die at the bottom of the cavity 38 descends, creating a larger chamber for the compound. Immediately afterwards however the same die, actuated by the same device that had lowered it just before (for example, a pneumatic cylinder 44) raises itself, simultaneously or immediately after the descent of piston 46, as can be seen in Fig. 3. During this phase there is also introduced, by hand or automatically, the strip of leather 48 which covers and adheres to the upper side of the sole which is being produced. Electrical resistances 42 heat the mould, and hence also the compound while it solidifies. Solidification takes very little time, of the order of 2 - 6 minutes, while the temperature does not go above 50 - 55° C, thus eliminating all risk of scorching or blackening, either localised or general, either of the sole and/or of the leather lining 48. The products obtained through the process and with the apparatus described do not show any appearance defects such as hollows due to absence or poor distribution of the cork granules, since there is also the possibility of inserting large quantities of the granules while the die is lowered. Soles obtained in this way show notable characteristics of resistance and flexibility, while the strips of leather which face them are intact and not stretched.

The discovery as described above could be modified or varied in many ways, all however without escaping from the ambit of the inventive concept. For example the procedure could handle the use of granules other than of cork in association with polyurethane, not only for the manufacture of soles for footwear, but also to obtain other products, for example thermal insulation or sound-absorbing panels. The introduction of the granules into the mixing vessel might be done by means of more than one screw conveyor, or alternatively, by compressed air.

Claims

1. Procedure for obtaining polyurethane compounds embodying granules of cork or similar substances, particularly for the manufacture of soles for footwear, characterised by the fact of including a first phase of the incorporation of the granules, which are introduced into the lower portion (26) of the mixing vessel (12) by means of a screw conveyor (28), where they meet the still-reacting polyurethane compound, a second phase consisting of the automatic transfer of the composite material incorporating the granules into a die (38) in the shaping moulds (40), a third phase consisting of the compression of the composite compound, for a time of between 2 and 6 minutes in the said moulds, and a fourth phase of the opening of the mould (40) and the automatic or manual extraction of the product.

2. Device for performing the procedure described in Claim 1., consisting of a mixing vessel (12) with a rotating agitator, feed pipes (18)(18′) for the resins and the isocyanates, and associated inlet valves (20)(20′) and outlet valve(s) (36), characterised by the fact that the said mixing vessel (12) is prolonged at the bottom below the stirrer so as to create a chamber (26) into which the granules of cork or similar substance are fed by means of a helical conveyor (28) driven by a motor (30), the said granules being there incorporated into the reacting polyurethane, the composite material thus obtained being subsequently fed, through the orifice (36), into the die or dies (38) in the shaping

moulds (40).

3. Device according to Claim 2. , characterised by the fact that at least the lower die (38) of the moulds (40) is moveable, and can be lowered to accept a larger quantity of the composite material being delivered from the mixing vessel (12) through the orifice (36).

4. Device according to the preceding Claims, characterised by the fact that the speed of the screw conveyor (28) can be regulated so that it will delivery a programmed quantity of granules, contained in the hopper (32), to the lower portion (26) of the mixing vessel (12).

5. Device according to the preceding Claims, characterised by the fact of having two or more screw conveyors, or compressed air tubes, for feeding the granules into the lower portion (26) of the mixing vessel (12).

6. Sole or insole for footwear produced according to the procedure in Claim 1., characterised by the fact that it is made of granules of cork or similar substance incorporated in a polyurethane compound compressed and heated to a maximum temperature of 55° C and for a period less than 5 minutes.

7. Procedure for obtaining polyurethane compounds incorporating granules of cork or similar substances, particularly for the manufacture of soles for footwear, as described, illustrated by examples, and for the purposes specified.

FIG. 1

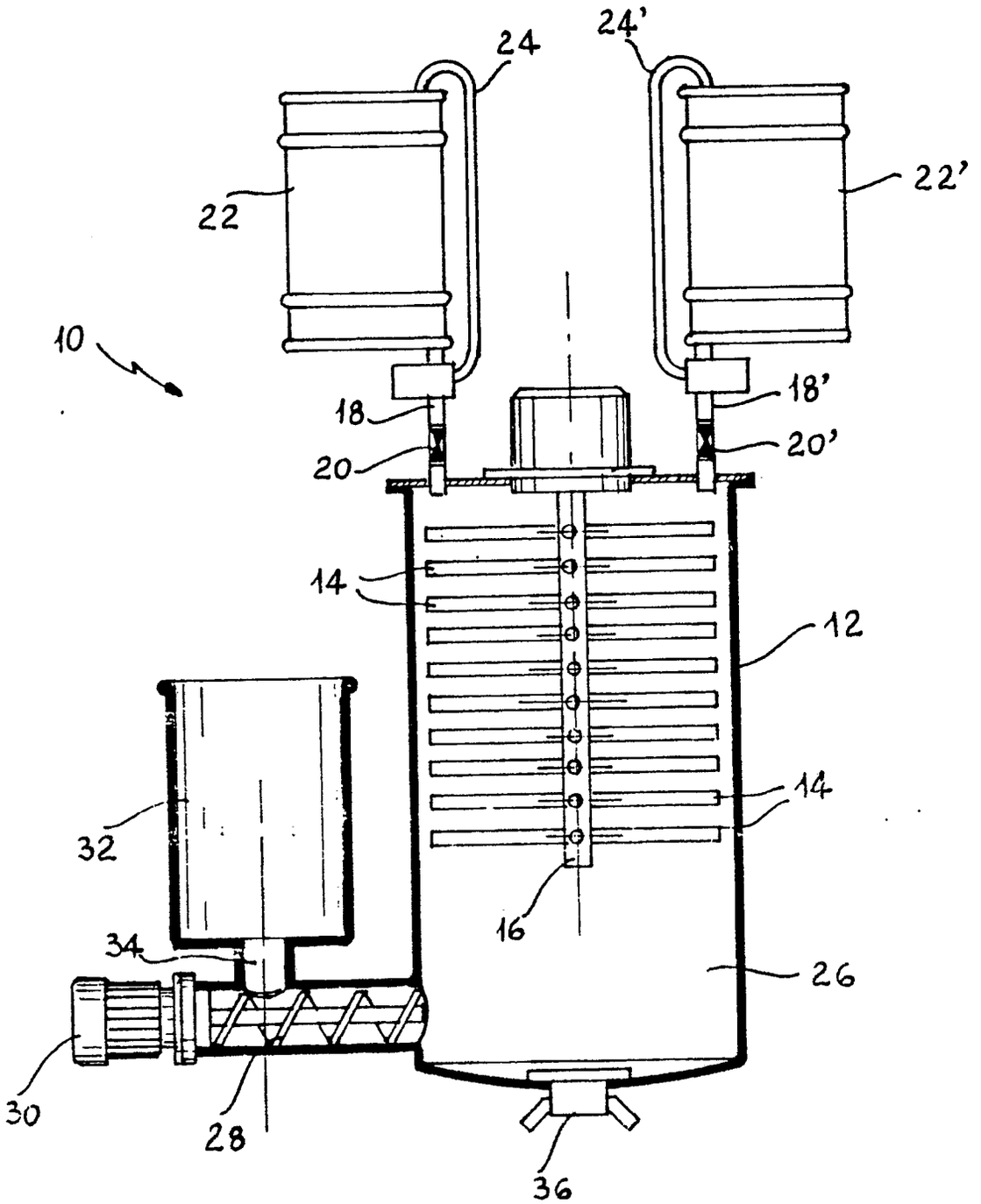


FIG. 3

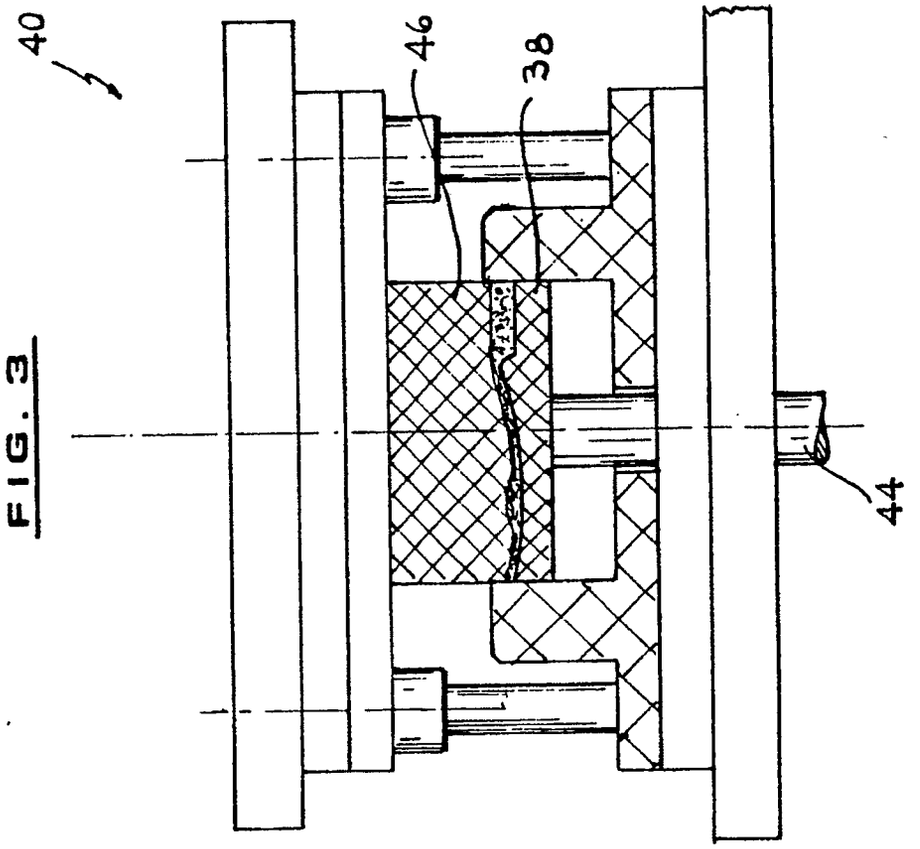


FIG. 2